

09774673-020101

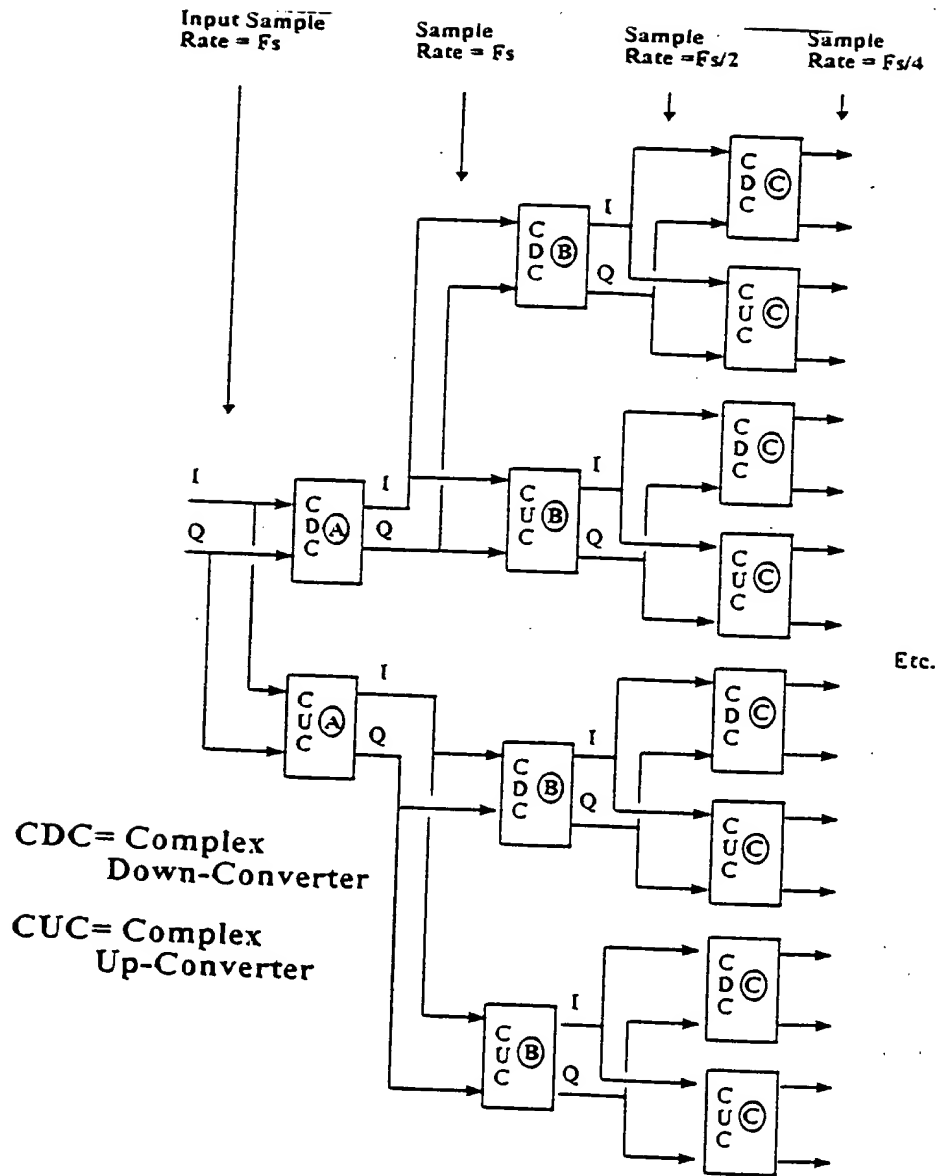


Fig. 1 Block Diagram of Tree System

2/19

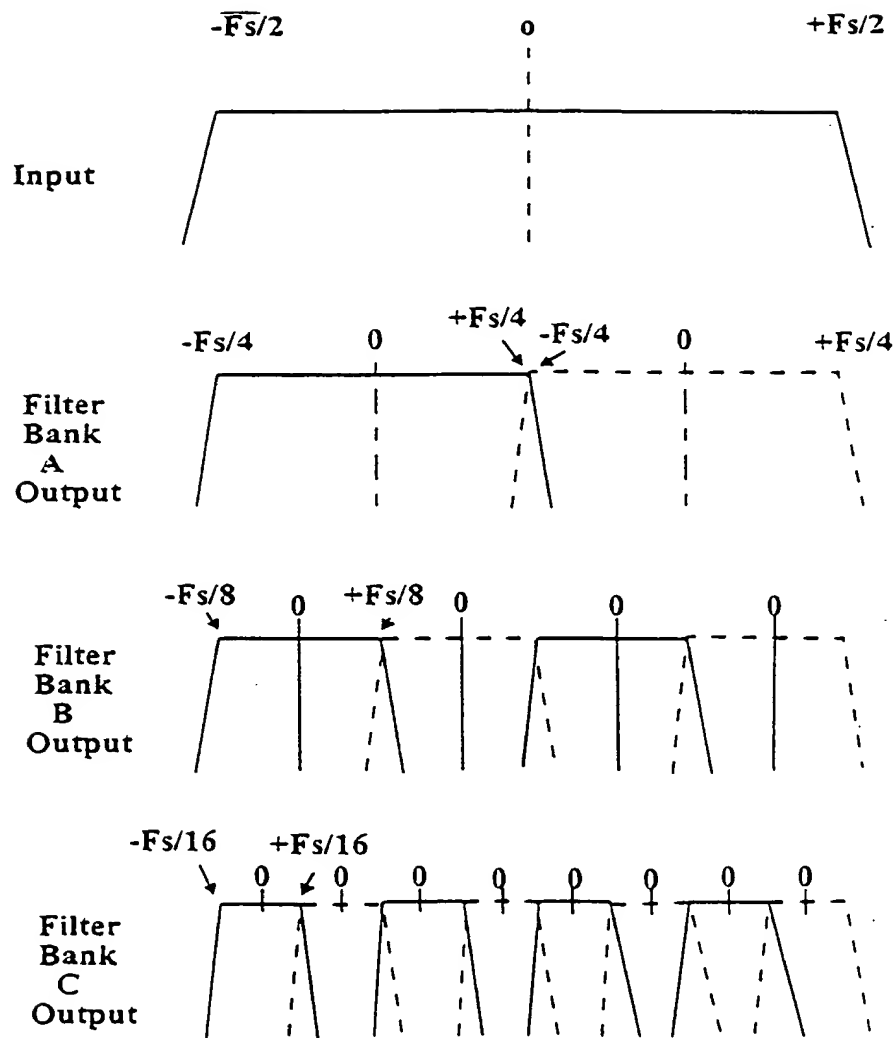


Fig. 2 Frequency Band Splitting

3/11/9

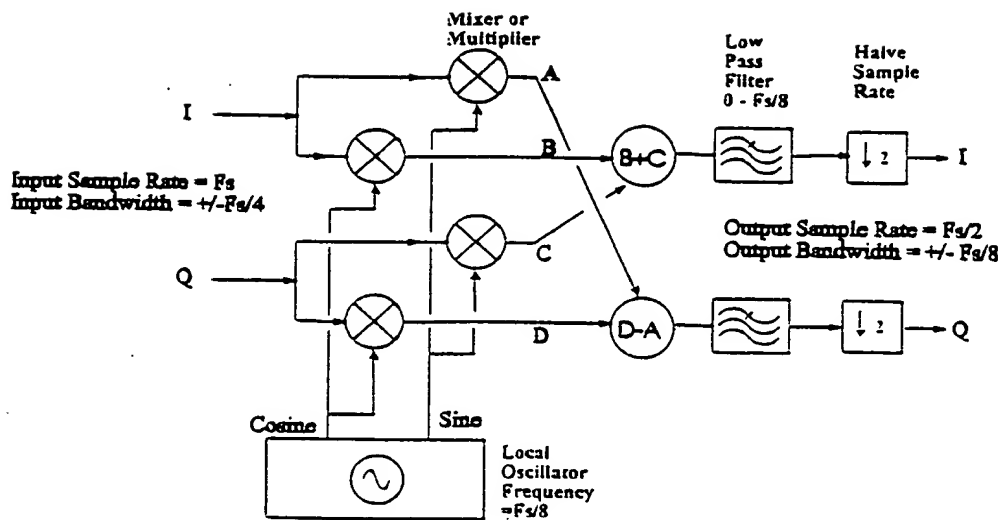


Fig. 3 Complex Down-Converter (CDC)

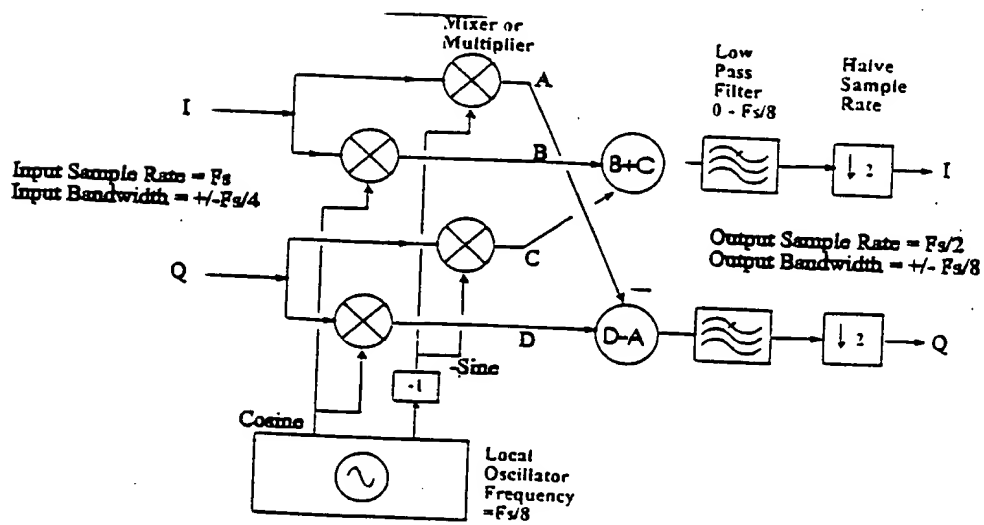


Fig. 4 Complex Up-Converter (CUC)

09774673-020101

4/19

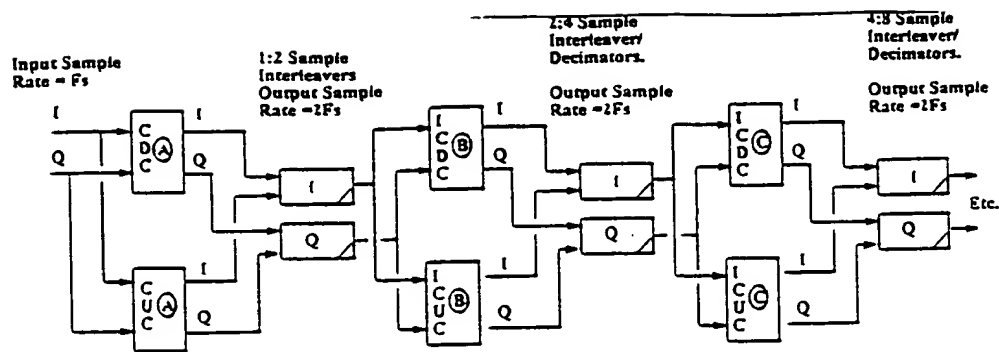


Figure 5 Block Diagram of Interleaved System

09774673-020101

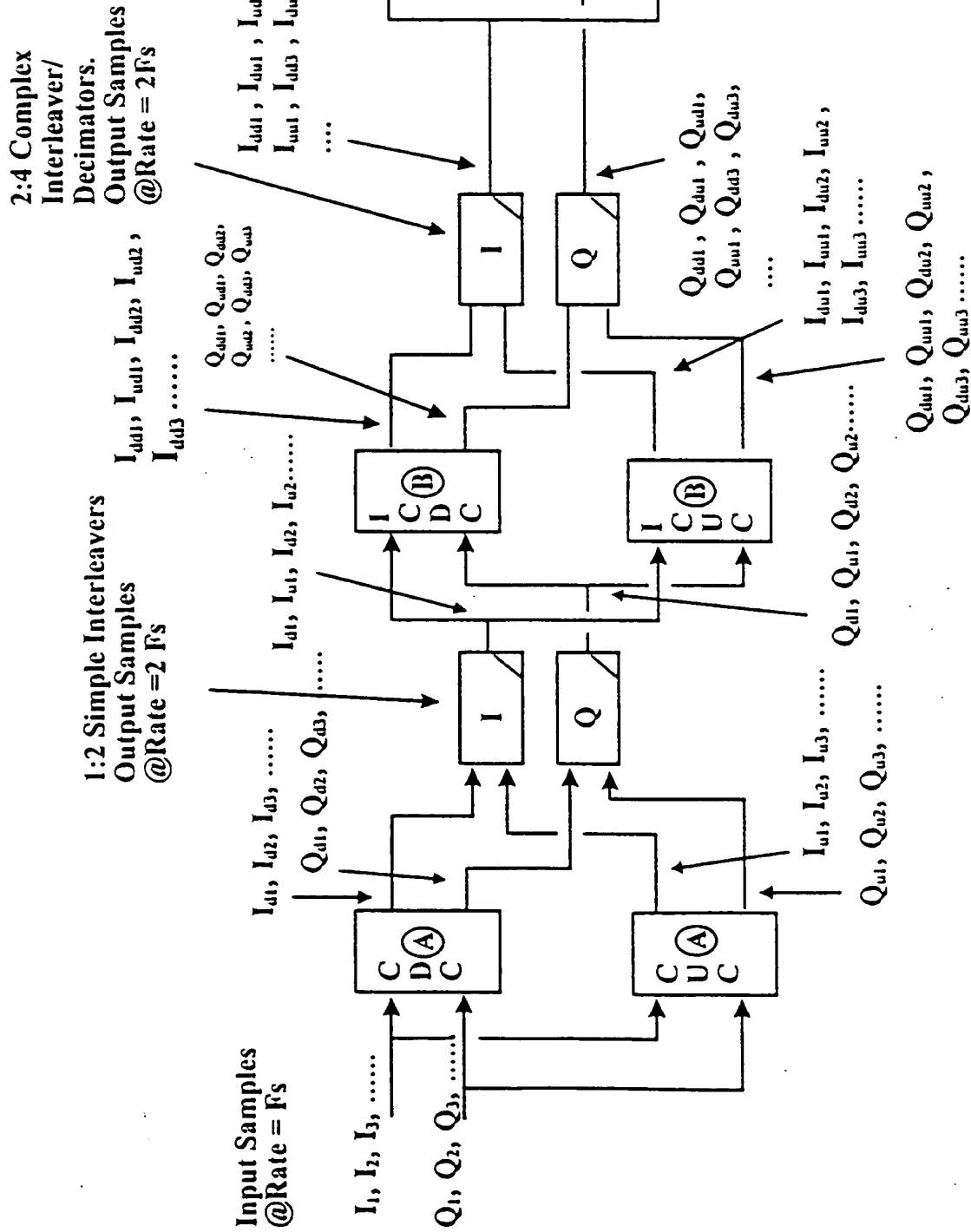
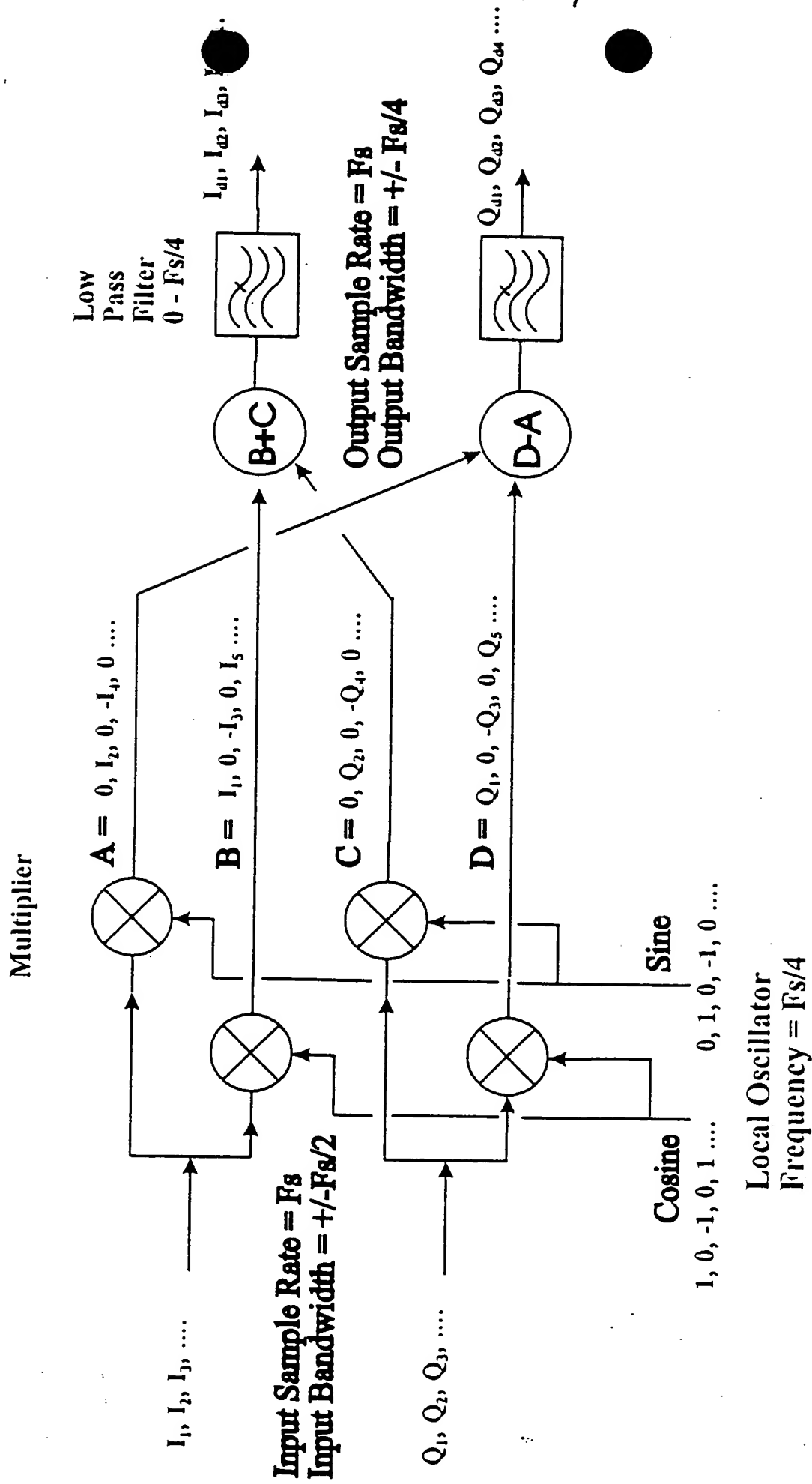
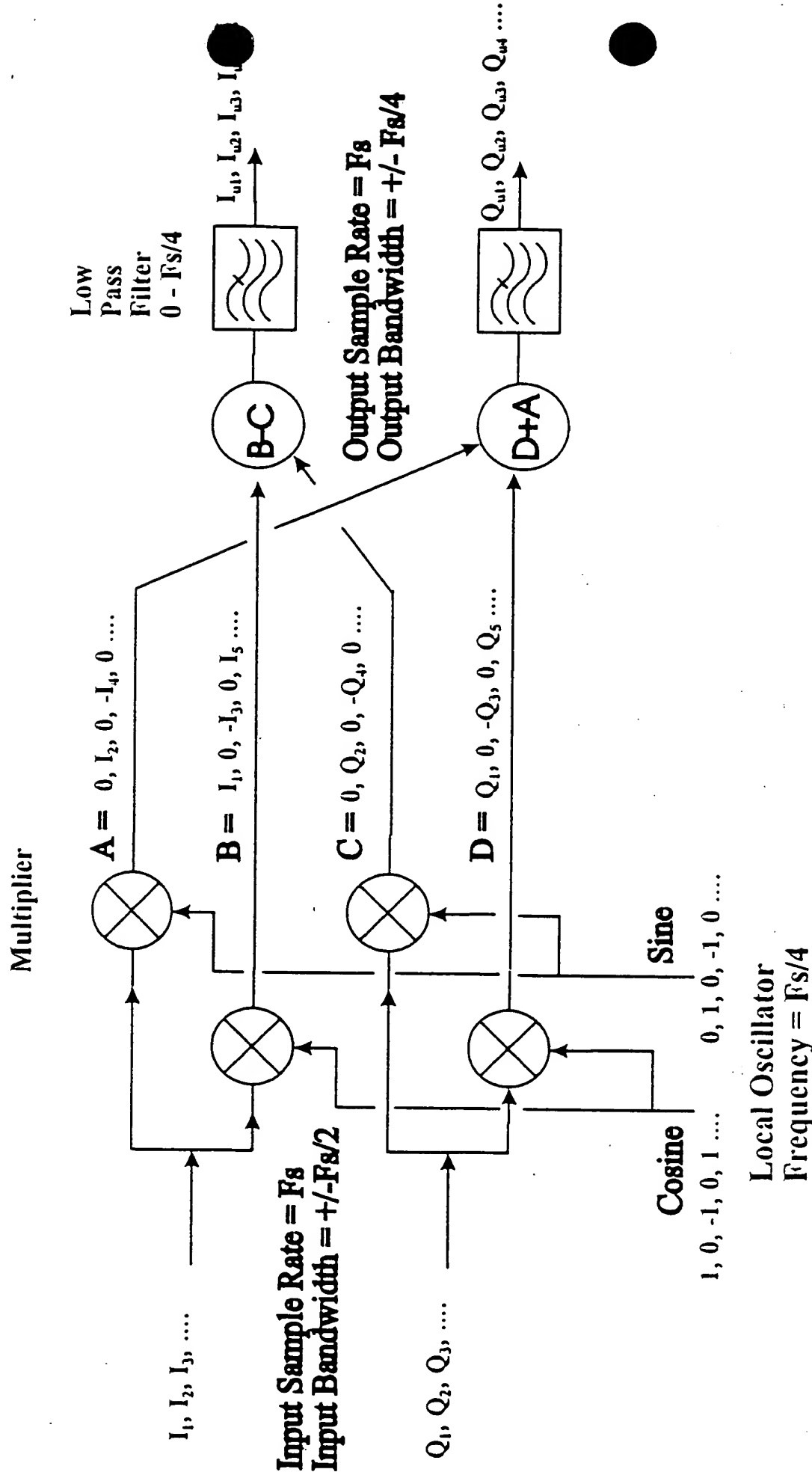


Figure 6 Detail of Interleavers



**Fig. 7 BASIC CDC(A) ARCHITECTURE**



**Fig. 8 BASIC CUC(A) ARCHITECTURE**

Input Sample Rate =  $F_s/2$   
 Input Bandwidth =  $\pm F_s/2$

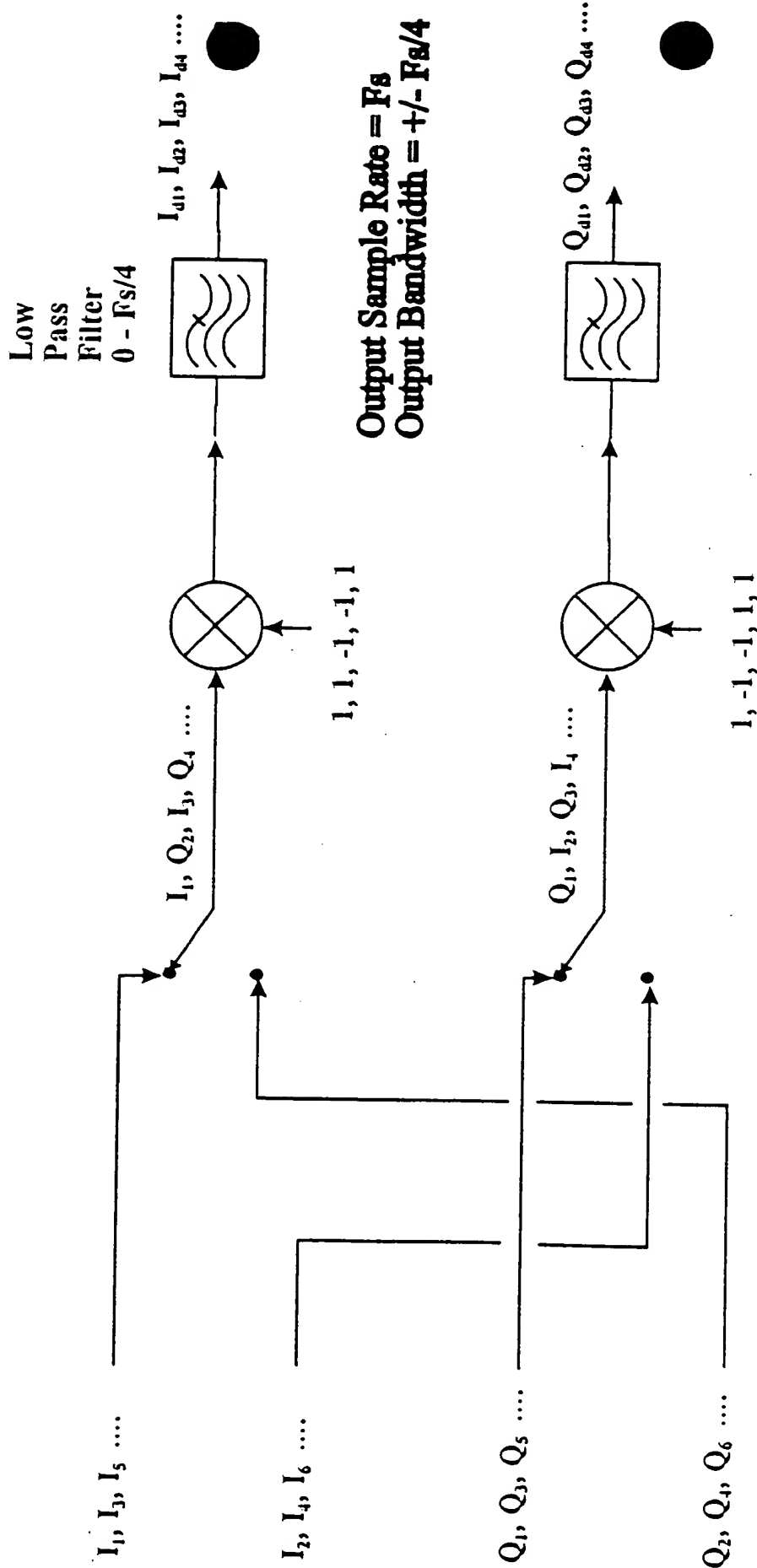


Fig. 9 MODIFIED CDC(A) ARCHITECTURE



Input Sample Rate =  $F_s/2$   
Input Bandwidth =  $\pm F_s/2$

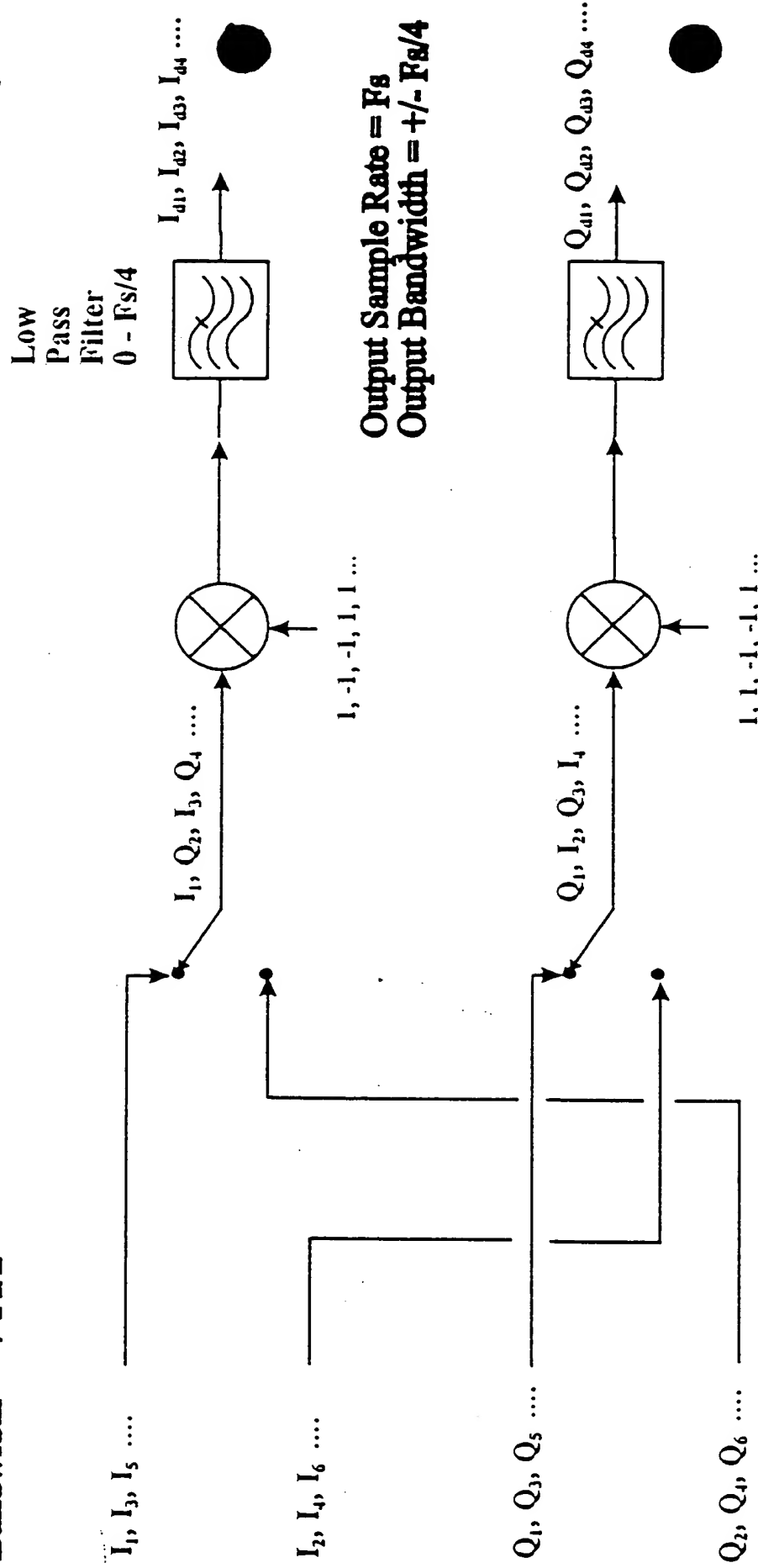


Fig. 10 MODIFIED CUC(A) ARCHITECTURE

Low  
Pass  
Filter  
 $0 - F_s/4$

Input Sample Rate =  $F_s/2$   
Input Bandwidth =  $\pm F_s/2$

$1, 1, -1, -1, 1, \dots$

$I_1, I_3, I_5, \dots$

$I_2, I_4, I_6, \dots$

$Q_1, Q_3, Q_5, \dots$

$Q_2, Q_4, Q_6, \dots$

$I_1, Q_2, I_3, Q_4, \dots$

$Q_1, I_2, Q_3, I_4, \dots$

$I_{d1}, I_{d2}, I_{d3}, I_{d4}, \dots$

$Q_{d1}, Q_{d2}, Q_{d3}, Q_{d4}, \dots$

$I_{u1}, I_{u2}, I_{u3}, I_{u4}, \dots$

$Q_{u1}, Q_{u2}, Q_{u3}, Q_{u4}, \dots$

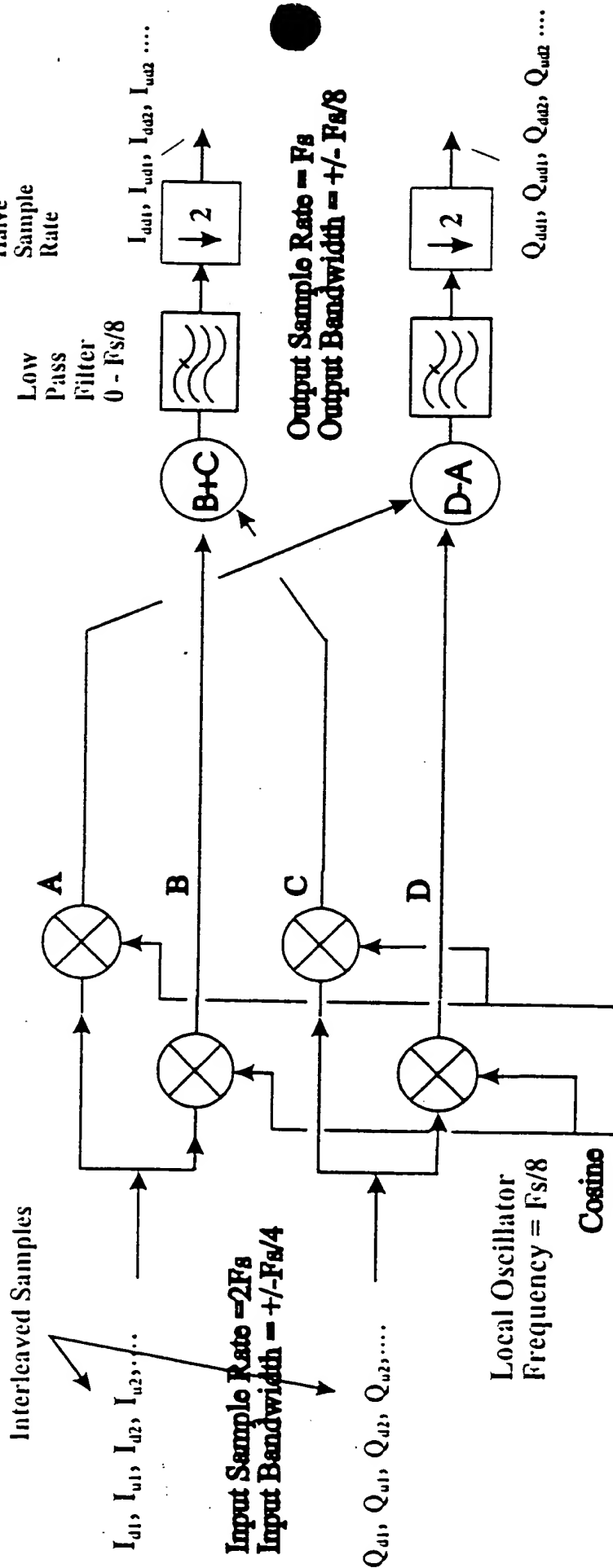
CDC

CUC

$1, -1, -1, 1, 1, \dots$

Fig. 11 COMBINED CDC(A) & CUC(A) ARCHITECTURE

Multiplier



$$\begin{aligned} \cos_{\text{odd}} &= 1, k, 0, -k, -1, -k, 0, k, \dots \\ \cos_{\text{even}} &= 1, k, 0, -k, -1, -k, 0, k, \dots \end{aligned}$$

$$\begin{aligned} \sin_{\text{odd}} &= 0, k, 1, k, 0, -k, -1, -k, \dots \\ \sin_{\text{even}} &= 0, k, 1, k, 0, -k, -1, -k, \dots \end{aligned}$$

$$\begin{aligned} A_{\text{odd}} &= 0, kI_{u2}, I_{u3}, kI_{u4}, 0, -kI_{u6}, -I_{u7}, -kI_{u8}, \dots \\ A_{\text{even}} &= 0, kI_{u2}, I_{u3}, kI_{u4}, 0, -kI_{u6}, -I_{u7}, -kI_{u8}, \dots \end{aligned}$$

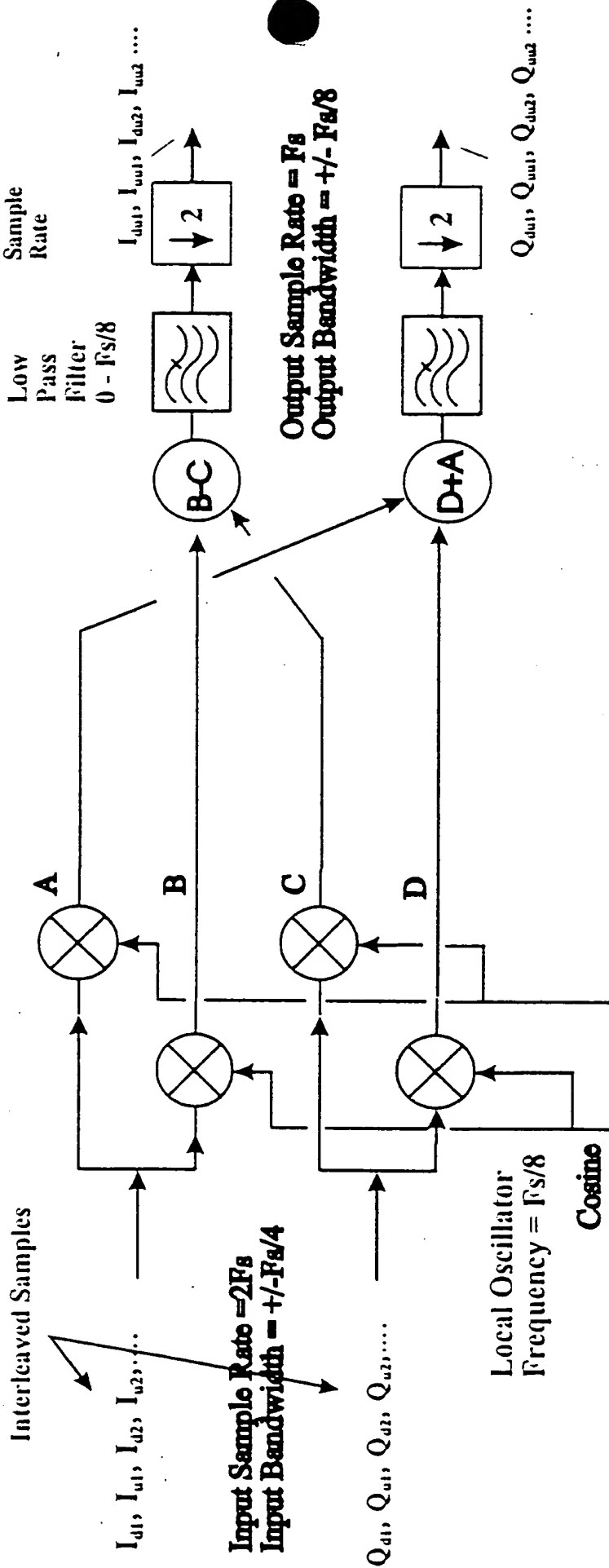
$$\begin{aligned} B_{\text{odd}} &= I_{u1}, kI_{u2}, 0, -kI_{u4}, -I_{u5}, -kI_{u6}, 0, kI_{u8}, \dots \\ B_{\text{even}} &= I_{u1}, kI_{u2}, 0, -kI_{u4}, -I_{u5}, -kI_{u6}, 0, kI_{u8}, \dots \end{aligned}$$

$$\begin{aligned} C_{\text{odd}} &= 0, kQ_{u2}, Q_{u3}, kQ_{u4}, 0, -kQ_{u6}, -Q_{u7}, -kQ_{u8}, \dots \\ C_{\text{even}} &= 0, kQ_{u2}, Q_{u3}, kQ_{u4}, 0, -kQ_{u6}, -Q_{u7}, -kQ_{u8}, \dots \end{aligned}$$

$$\begin{aligned} D_{\text{odd}} &= Q_{u1}, kQ_{u2}, 0, -kQ_{u4}, -Q_{u5}, -kQ_{u6}, 0, kQ_{u8}, \dots \\ D_{\text{even}} &= Q_{u1}, kQ_{u2}, 0, -kQ_{u4}, -Q_{u5}, -kQ_{u6}, 0, kQ_{u8}, \dots \end{aligned}$$

Fig. 12 BASIC ICDC(B) ARCHITECTURE

Multiplier



$$\begin{aligned} \cos_{\text{odd}} &= 1, k, 0, -k, -1, -k, 0, k, \dots \\ \cos_{\text{even}} &= 1, k, 0, -k, -1, -k, 0, k, \dots \end{aligned}$$

$$\begin{aligned} \sin_{\text{odd}} &= 0, k, 1, k, 0, -k, -1, -k, \dots \\ \sin_{\text{even}} &= 0, k, 1, k, 0, -k, -1, -k, \dots \end{aligned}$$

$$\begin{aligned} A_{\text{odd}} &= 0, kI_{u2}, I_{u3}, kI_{u4}, 0, -kI_{u6}, -I_{u7}, -kI_{u8} \dots \\ A_{\text{even}} &= 0, kI_{u2}, I_{u3}, kI_{u4}, 0, -kI_{u6}, -I_{u7}, -kI_{u8} \dots \end{aligned}$$

$$\begin{aligned} B_{\text{odd}} &= I_{u1}, kI_{u2}, 0, -kI_{u4}, -I_{u5}, -kI_{u6}, 0, kI_{u8} \dots \\ B_{\text{even}} &= I_{u1}, kI_{u2}, 0, -kI_{u4}, -I_{u5}, -kI_{u6}, 0, kI_{u8} \dots \end{aligned}$$

$$\begin{aligned} C_{\text{odd}} &= 0, kQ_{u2}, Q_{u3}, kQ_{u4}, 0, -kQ_{u6}, -Q_{u7}, -kQ_{u8} \dots \\ C_{\text{even}} &= 0, kQ_{u2}, Q_{u3}, kQ_{u4}, 0, -kQ_{u6}, -Q_{u7}, -kQ_{u8} \dots \end{aligned}$$

$$\begin{aligned} D_{\text{odd}} &= Q_{u1}, kQ_{u2}, 0, -kQ_{u4}, -Q_{u5}, -kQ_{u6}, 0, kQ_{u8} \dots \\ D_{\text{even}} &= Q_{u1}, kQ_{u2}, 0, -kQ_{u4}, -Q_{u5}, -kQ_{u6}, 0, kQ_{u8} \dots \end{aligned}$$

Fig. 13 BASIC ICUC(B) ARCHITECTURE

Input Samples  
@Rate =  $f_s$

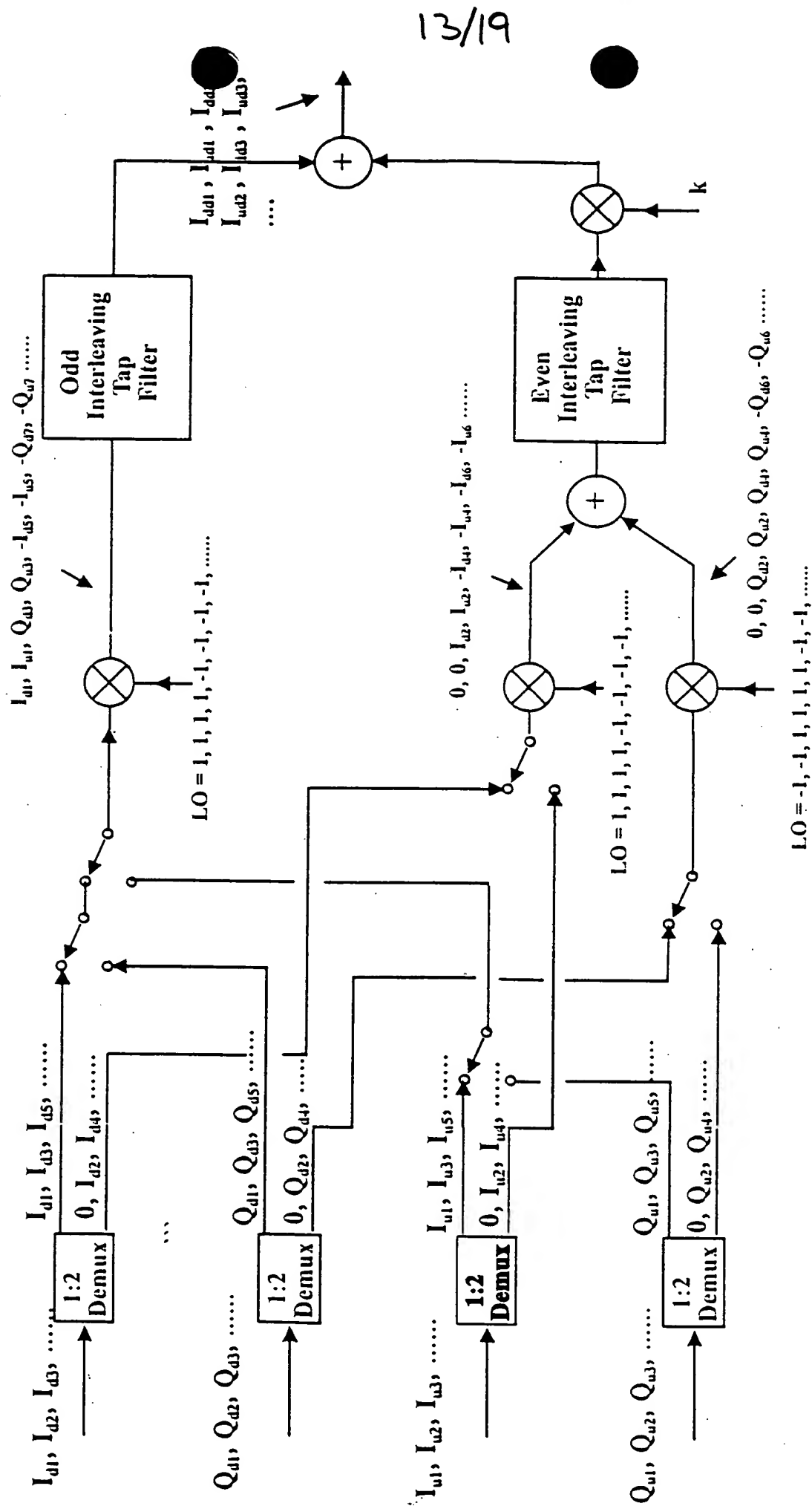


Figure 14 Simplified ICDC(B), I channel Only

Input Samples  
@Rate =  $F_s$

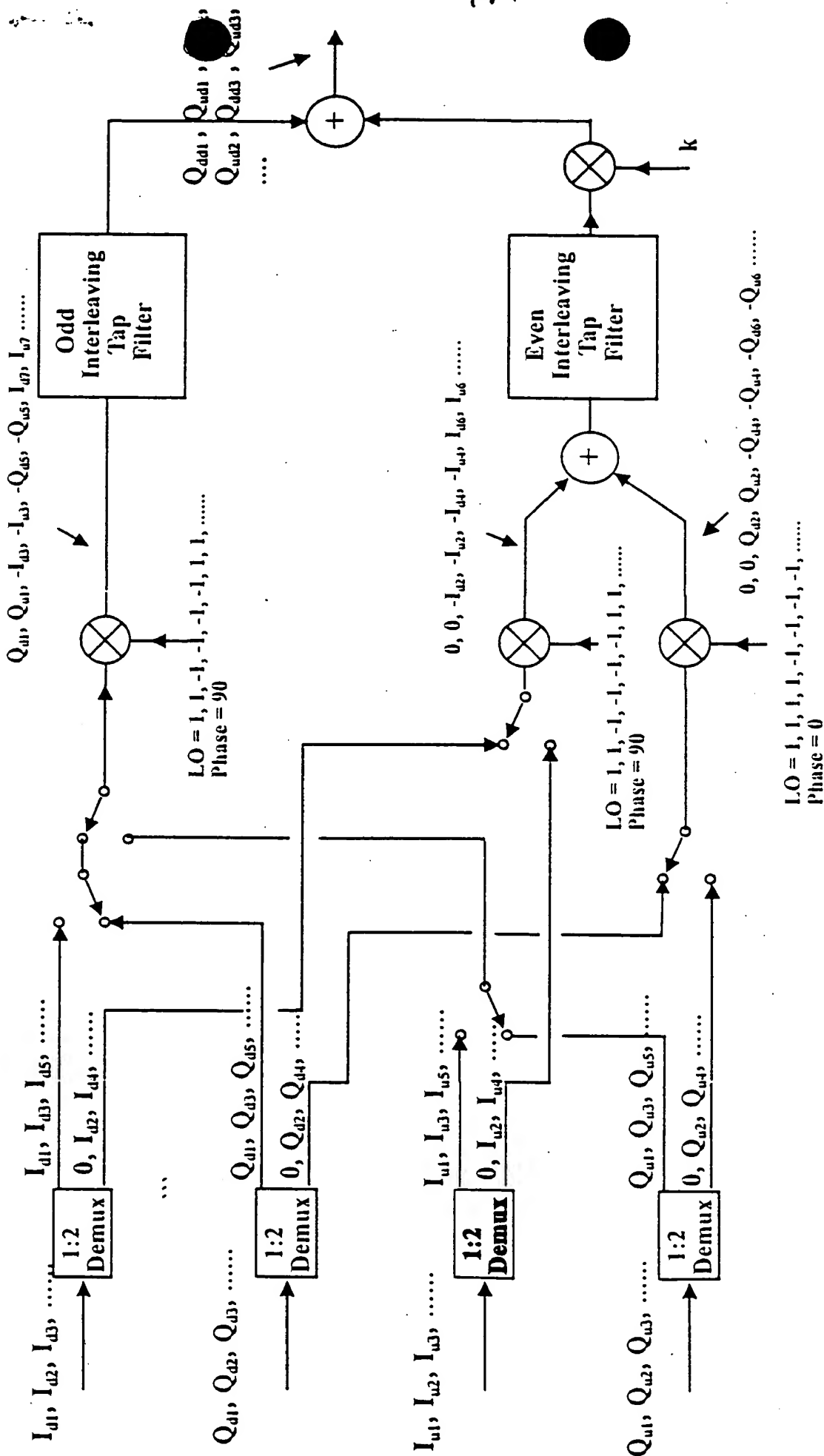


Figure 15 Simplified ICDC(B), Q channel Only

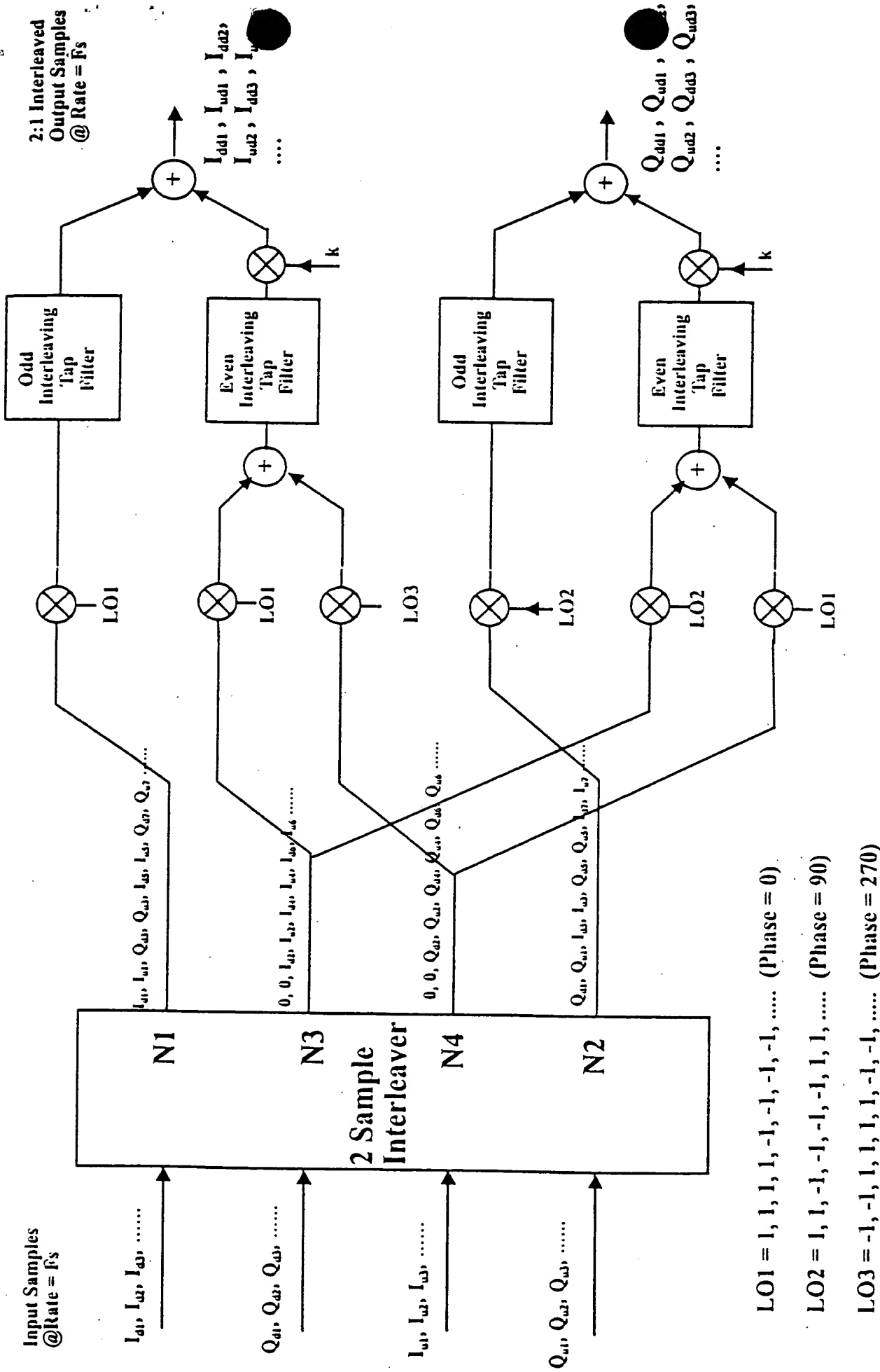


Figure 16 Simplified ICDC(B), Combined I & Q Channels

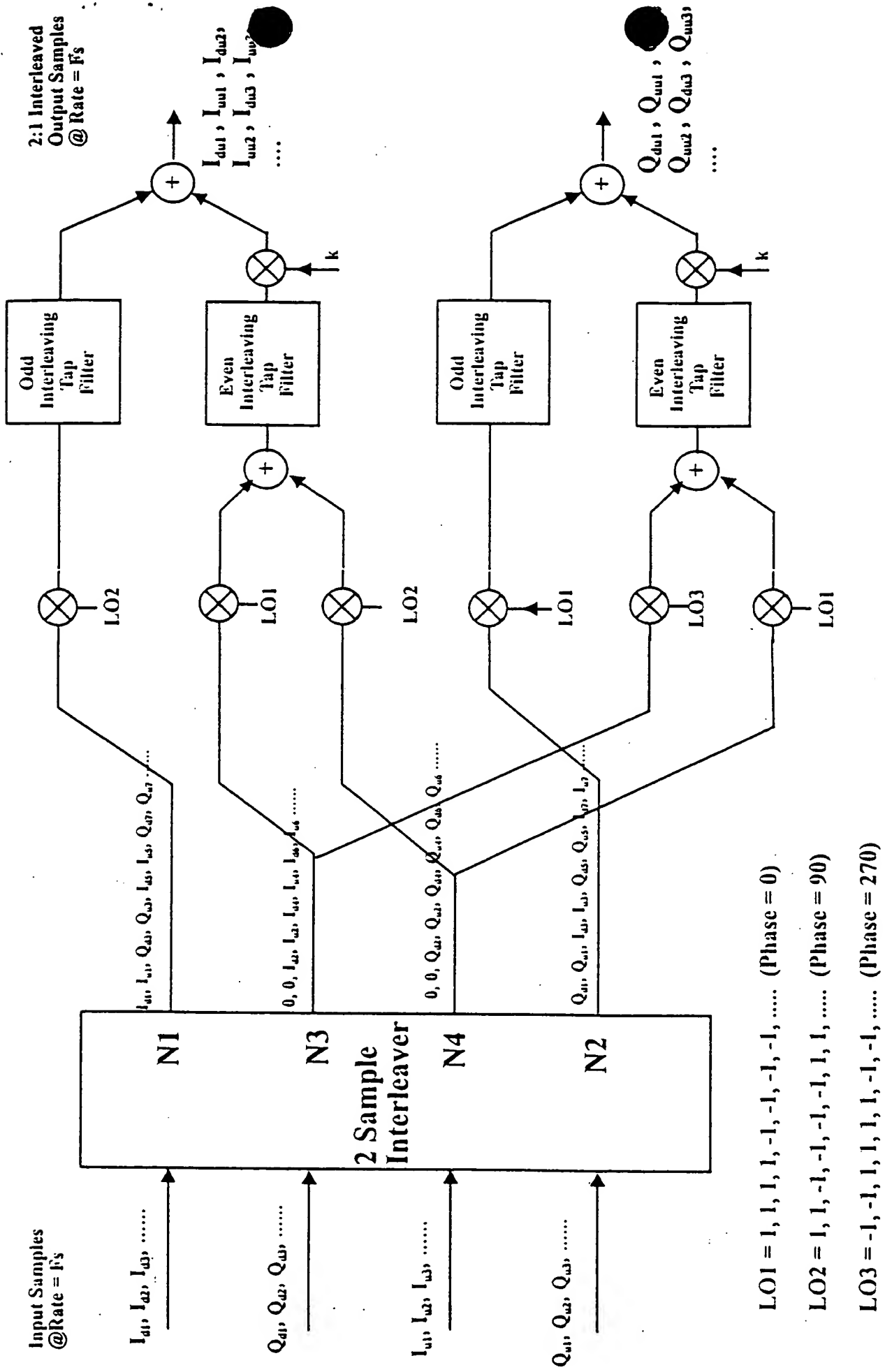


Figure 17 Simplified ICUC(B), Combined I & Q Channels



17/19

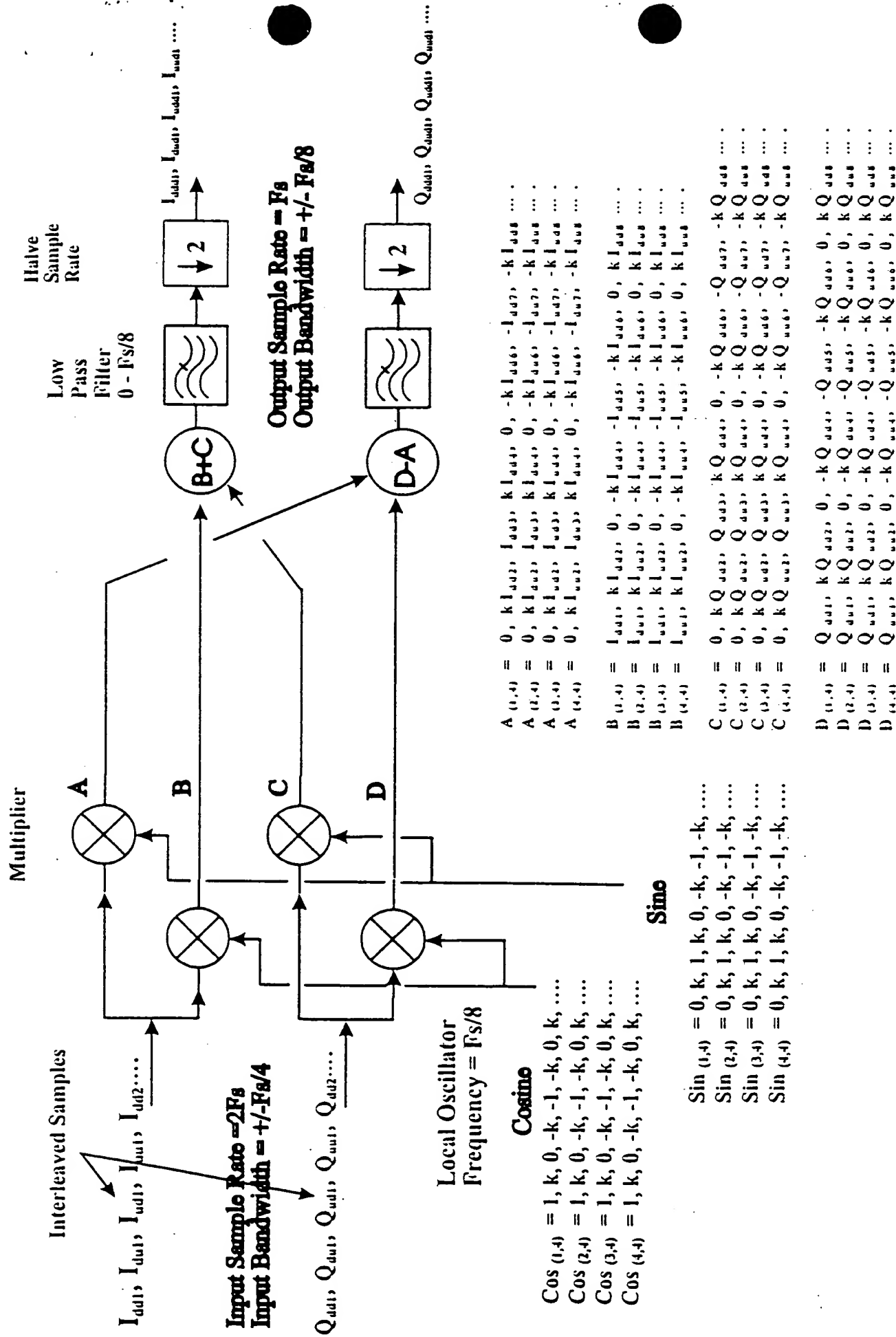
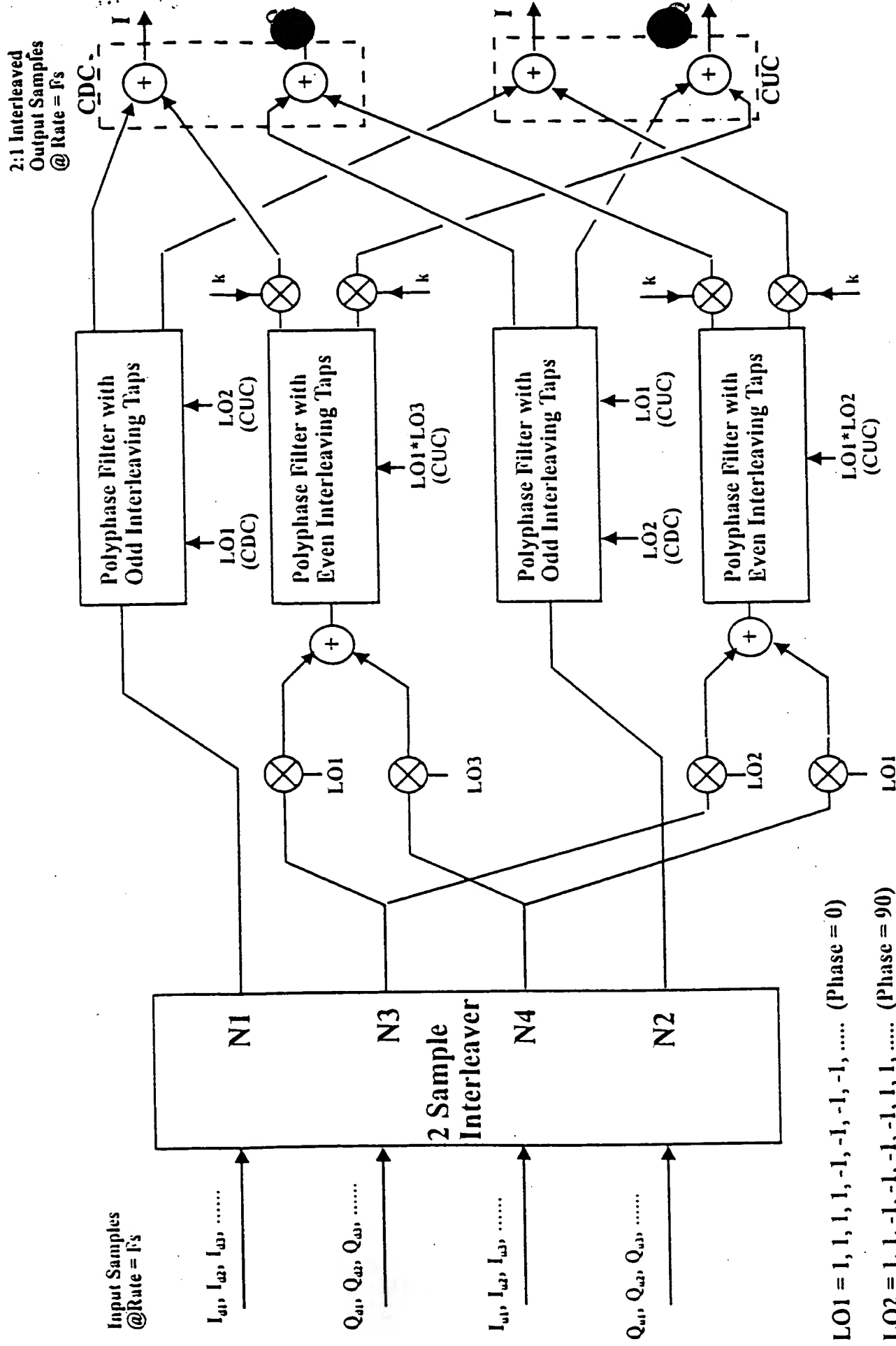


Fig. 18 BASIC ICDC(C) ARCHITECTURE





LO1 = 1, 1, 1, -1, -1, -1, -1, ... (Phase = 0)

LO2 = 1, 1, -1, -1, -1, -1, 1, 1, ... (Phase = 90)

LO3 = -1, -1, 1, 1, 1, 1, -1, -1, ... (Phase = 270)

Figure 20 Combined ICDC(B) / ICUC(B) With Polyphase Filters